METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR OCTOBER 1940

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

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The mean surface temperatures during October (chart I) were above normal over all of the United States, except in the northeast and in a narrow strip along the Atlantic coast to the southward as well as in the extreme east Gulf States. Somewhat more than one-half of the country was 4° F. or more above normal for the month while a considerable area in the upper Mississippi River Valley and North Central States was 8° or more above normal. Small scattered areas in the extreme eastern part of the country were about 4° below normal.

At the 1,500-meter level the direction of the 5 a. m. resultant wind was more northerly than normal for October at most stations in the northeast, the east central and over most of the northwestern parts of the United States, while resultant directions were more southerly than normal at this level over the rest of the country. At the 3,000-meter level the 5 a. m. resultant winds were north of normal over the eastern half of the country and were south of normal to the westward. At the 5,000-meter level the direction of the resultant wind at 5 p. m. was south of the corresponding 5 a. m. normal at most stations in the United States, there being only four stations at scattered locations in the central portion of the country at which the evening resultant wind was north of the morning normal.

The 5 a. m. resultant velocity at the 1,500-meter level was considerably above normal in the northwest, was considerably below normal in the northeast, and varied but slightly from normal over the rest of the country. At 3,000 meters the 5 a. m. resultant velocity was considerably above normal in the northwest and west-central portions of the United States and was generally below normal over the rest of the country. Except at two stations the velocity of the 5 p. m. resultant wind during October at the 5,000-meter level was above the corresponding 5 a. m. normal.

During October there was an agreement between the large area of above-normal surface temperature departure and the area where the resultant winds were from directions south of normal at the 1,500-, 3,000-, and 5,000-meter levels, and a corresponding agreement between areas of below normal surface temperatures and the shifting of resultant winds to the north of normal at these levels. This agreement between temperature departures and departures of resultant winds from normal direction was somewhat better at the 3,000- and 5,000-meter levels than at the 1,500-meter level, but was not as well marked as was the case at all three of these levels in September.

The direction of resultant winds at 5 p. m., was in general to the south of the corresponding 5 a. m. winds during October at both the 1,500- and the 3,000-meter levels. The opposite turning in the direction of resultant winds during the day was noted at several northwestern stations at the lower of these two levels and at several stations principally in the extreme east and extreme north at the upper of these levels. The resultant velocity at 5 p. m. was in general lower than the corresponding 5 a. m. velocity at the 1,500-meter level while it was higher than the morning velocity at the 3,000-meter level.

The upper-air data discussed above are based on 5 a. m. observations (charts VIII and IX) as well as on observations made at 5 p. m. (table 2 and charts X and XI).

The highest pressure at the 2,000-meter level was observed at Pensacola, Fla., while at each of the 1,000-meter levels from 3,000 meters, up to and including 15,000 meters the maximum pressure was observed at Brownsville. At the 16,000- and 17,000-meter levels maximum pressures of 110 and 93 millibars, respectively, were recorded at both Brownsville and San Diego. The maximum pressure for the 18,000-meter level was recorded at San Diego. The lowest pressure for each of the 1,000-meter levels from 2,000 to 18,000 meters, inclusive, was observed at Sault Ste. Marie.

Mean pressures were lower in October than in September over most of the United States at all levels from 1,500 meters up to at least 14,000 meters. Below 1,500 meters, however, the mean October pressures were higher than in the preceding month over the Gulf coast, the eastern one-third of the country and along the Pacific coast. The decrease in mean pressures for October at upper levels as compared to the corresponding pressure for September was especially well marked over the central part of the United States there being noted, for example, a decrease in mean pressure of 10 millibars over Bismarck, N. Dak., at levels from 5,000 to 11,000 meters, inclusive.

At the 9,000 and 10,000 meter levels a maximum difference of 21 millibars was observed between the monthly mean pressure at Brownsville and that at Sault Ste. Marie. The steepest pressure gradients for the month, however, were observed between Sault Ste. Marie and Joliet at the 7,000- and 8,000-meter levels. At both of these levels a change in pressure of about 1 millibar occurred with each 50 miles of the horizontal distance between Sault Ste. Marie and Joliet.

Temperatures were lower at all stations over the United States in October than in the previous month at levels from surface up to at least 13,000 meters. From 14,000 up to 19,000 meters temperatures were also lower than in the previous month except that along the Atlantic coast and at scattered stations in the western half of the country temperatures were higher at these upper levels than they were in September.

The mean monthly temperatures in October 1940 were lower than those in October 1939 at the surface and up to 5,000 meters over the extreme west, most of the eastern one-third of the country and over the Gulf coast while temperatures were higher than last year at these levels over the rest of the country. From 6,000 up to 17,000 meters the temperatures were generally warmer than last year over the western third of the country with a slight tendency to cooler temperatures to the eastward at these upper levels.

The altitude at which a mean temperature of 0° C. was observed during October varied from 1,700 meters (mean sea level) over Sault Ste. Marie to 4,600 meters over Brownsville. As observed at Weather Bureau stations this level of average freezing temperature was 3,700 meters or higher above sea level over all of the country south of 35° N. latitude. The cold continental air masses had much more cooling effect this month over the eastern half of the Northern States, than did the cold Pacific air masses and more modified continental air masses which reached the western half of the Northern States. This is shown by the level of average freezing temperature at 2,900 meters at Great Falls, Mont., and 3,000 meters at Bismarck as compared to 1,700 meters at Sault Ste. Marie

Mean freezing temperatures occurred at lower levels than during the previous month at all stations, being observed much lower at Bismarck (1,200 mean lower) and at Sault Ste. Marie (1,400 mean lower).

The lowest minimum temperature which was reported by any radiosonde station during the month, and accepted as correct, was −81.0° C. (−113.8° F.) observed over Brownsville, Tex., on October 7 at a height of 16,700 meters (about 10.4 miles) above sea level.

Table 3 shows the maximum free air wind velocities and their directions for various sections of the United States during October as determined by pilot balloon observations. The extreme maximum for the month was 72.7 meters per second (162 miles per hour) observed over Las Vegas, Nev., on October 2. This high wind was blowing from the west-southwest at an elevation of 12,460 meters (about 7.7 miles) above sea level. The highest velocity observed at pilot balloon stations in October during the past 4 years was 78 meters per second (174 miles per hour) observed at 7,960 meters above sea level over Denver, Colo., on October 17, 1938.

Tropopause data for October showing the mean altitude and temperature of the tropopause at various stations are shown in table 4 and on chart XIII.

MEAN ISENTROPIC CHART [1]

The circulation during October 1940 was typical of an active westerly current aloft, with distortions in the mean west to east flow appearing as waves of small amplitude and long wave length. Another feature of the October data was the absence of stagnant vortices which is also typical of active westerlies. Under such conditions the Northwest States on the left side of the principal moist tongue receive considerable precipitation because of more than normal frontal and orographic activity. The importance of the orographic effects was further illustrated by the deficiencies of precipitation in the lee of the Rockies.

Frontal activity over the Plains States resulted in a more random distribution of precipitation, but over the northeastern United States the deficiency of precipitation was well correlated with the predominant flow of dry air from the northwest.

[1] Prepared by A. K. Showalter, Hydrometeorological Section.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees, Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during October 1940*

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																							
	Anchorage, Alaska (41 m.)				Bismarck, N. Dak. (505 m.)				Brownsville, Tex. (6 m.)				Charleston, S. C. (14 m.)				Denver, Colo. (1,616 m.)				El Paso, Tex. (1,193 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	27	993	2.5	81	31	955	7.8	79	31	1,016	20.8	86	31	1,017	13.5	91	31	840	7.9	68	31	884	16.2	53
500	27	938	2.6	74					31	960	20.0	83	31	961	17.0	67								
1,000	27	882	0.2	73	31	900	10.8	61	31	906	17.3	75	31	906	14.4	62								
1,500	27	828	−2.9	74	31	847	8.6	56	31	854	15.4	63	31	854	11.4	60					31	853	17.9	48
2,000	27	777	−6.1	76	31	797	5.7	56	31	805	13.2	57	31	804	9.0	55	31	802	11.7	58	31	804	14.9	46
2,500	27	729	−8.7	75	31	750	2.9	55	31	758	10.7	50	31	756	6.2	51	31	755	8.9	52	31	758	11.5	46
3,000	26	683	−11.6	74	31	705	.1	56	31	714	8.9	44	31	711	3.5	46	31	710	5.5	50	31	713	7.9	46
4,000	26	598	−17.9	73	31	621	−5.7	53	31	632	3.7	41	31	628	−1.4	35	31	628	−1.8	51	31	631	1.0	46
5,000	25	523	−24.9	70	31	546	−11.9	51	30	558	−2.1	35	31	554	−6.9	30	28	553	−8.7	51	31	557	−5.9	44
6,000	25	455	−32.4	69	30	478	−18.8	48	30	492	−8.4	33	30	486	−13.0	29	27	485	−15.5	46	31	489	−12.9	40
7,000	25	393	−40.2	----	29	418	−26.2	47	29	432	−15.3	34	30	426	−20.4	28	26	424	−22.5	44	29	429	−19.4	37
8,000	25	339	−47.1	----	27	363	−33.9	45	29	377	−22.2	35	30	371	−28.3	28	26	370	−29.7	44	28	374	−26.4	37
9,000	25	290	−51.6	----	27	314	−41.6	----	28	329	−29.2	35	30	321	−36.4	28	27	320	−37.7	44	26	325	−33.3	36
10,000	25	249	−53.2	----	27	270	−49.4	----	27	286	−36.4	35	30	278	−43.9	----	28	276	−44.9	----	26	281	−40.1	----
11,000	25	214	−51.1	----	26	231	−55.3	----	26	246	−44.0	----	30	239	−50.0	----	27	238	−51.1	----	26	242	−47.0	----
12,000	25	183	−50.4	----	25	198	−58.1	----	25	212	−51.2	----	30	205	−54.5	----	22	204	−55.6	----	26	208	−52.9	----
13,000	25	157	−50.3	----	25	169	−59.3	----	23	181	−57.8	----	30	175	−58.4	----	21	174	−58.8	----	26	178	−58.3	----
14,000	24	134	−50.8	----	24	144	−60.2	----	21	154	−64.5	----	30	149	−61.5	----	20	148	−61.4	----	26	151	−63.7	----
15,000	23	115	−50.6	----	22	122	−60.8	----	21	130	−70.2	----	30	126	−64.5	----	18	126	−64.2	----	24	128	−68.4	----
16,000	22	99	−50.3	----	21	104	−61.3	----	21	110	−73.3	----	30	108	−66.9	----	18	107	−65.0	----	23	108	−71.8	----
17,000	20	85	−50.6	----	18	88	−61.4	----	17	93	−72.9	----	30	91	−66.9	----	17	90	−64.7	----	21	92	−71.3	----
18,000	11	72	−51.2	----	13	76	−60.7	----	16	78	−70.4	----	29	77	−65.4	----	14	77	−64.5	----	21	77	−68.2	----
19,000	5	62	−52.1	----	7	64	−60.3	----	13	66	−68.0	----	23	66	−63.4	----	11	65	−63.7	----	17	66	−64.0	----
20,000	----	----	----	----	5	54	−60.1	----	10	56	−64.9	----	18	56	−61.3	----	7	55	−62.5	----	10	55	−61.3	----
21,000	----	----	----	----	----	----	----	----	7	47	−62.0	----	7	47	−59.4	----	----	----	----	----	----	----	----	----
22,000	----	----	----	----	----	----	----	----	6	40	−59.5	----	----	----	----	----	----	----	----	----	----	----	----	----

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees, Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during October 1940*—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																					
	Ely, Nev. (1,908 m.)				Great Falls, Mont. (1,117 m.)				Joliet, Ill. (178 m.)				Ketchikan, Alaska (26 m.)				Lakehurst, N. J.[1] (39 m.)				Medford, Oreg. (401 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	811	4.6	55	31	888	9.5	65	28	997	9.6	86	28	1,006	9.6	78	31	1,014	6.7	86	30	968	11.5	82
500									28	960	12.1	71	28	950	7.7	80	31	958	7.8	68	30	957	12.1	78
1,000									28	904	10.4	66	27	894	4.2	82	31	902	5.7	64	30	901	11.6	67
1,500					31	848	9.5	59	28	850	7.8	65	27	839	.8	83	31	848	4.0	57	30	849	8.9	68
2,000	31	802	7.1	52	31	798	6.0	60	28	800	5.5	59	27	789	−1.9	80	31	797	2.8	51	30	798	6.0	66
2,500	31	755	7.4	47	31	750	2.5	60	28	753	2.9	55	27	741	−4.6	72	31	750	.9	54	30	751	3.2	59
3,000	31	710	3.9	47	31	705	−.4	59	28	707	.6	51	27	695	−7.6	68	30	704	−1.2	54	30	706	.3	55
4,000	30	627	−3.1	46	31	622	−6.1	56	27	624	−5.2	48	27	610	−13.4	63	29	620	−6.4	54	30	622	−5.1	51
5,000	30	552	−8.7	41	31	546	−12.7	56	27	548	−11.7	45	27	534	−19.4	60	24	545	−12.4	48	30	547	−11.4	47
6,000	30	484	−15.6	40	31	479	−19.6	55	27	480	−18.3	43	27	466	−26.0	60	23	477	−18.9	38	30	480	−17.8	45
7,000	30	423	−23.0	39	31	418	−26.5	53	27	420	−25.6	41	26	405	−33.1	60	23	417	−26.0	35	30	419	−24.9	44
8,000	29	368	−30.6	38	31	363	−34.2	52	25	365	−33.3	40	26	350	−40.0	61	23	362	−33.5	36	29	364	−32.1	43
9,000	28	319	−37.4	37	30	314	−41.9	----	24	315	−41.2	----	26	302	−46.4	----	23	313	−41.2	----	29	315	−39.2	42
10,000	26	276	−44.6	----	29	270	−49.4	----	23	272	−48.6	----	26	260	−51.0	----	21	270	−48.1	----	29	272	−45.8	----
11,000	26	237	−51.2	----	29	232	−54.2	----	22	233	−54.5	----	25	223	−53.5	----	21	232	−53.7	----	27	234	−51.1	----
12,000	26	203	−55.2	----	29	198	−56.4	----	21	199	−58.4	----	23	190	−53.7	----	21	198	−56.9	----	23	200	−55.7	----
13,000	25	174	−58.2	----	29	169	−57.5	----	20	170	−59.8	----	20	163	−53.1	----	19	169	−57.6	----	22	170	−58.2	----
14,000	25	148	−60.3	----	29	144	−58.3	----	17	145	−61.0	----	18	139	−52.5	----	17	145	−58.7	----	22	145	−60.4	----
15,000	25	126	−62.3	----	27	123	−59.3	----	17	123	−62.7	----	18	119	−52.6	----	13	123	−59.8	----	21	124	−62.0	----
16,000	23	107	−63.2	----	24	105	−60.1	----	17	104	−63.5	----	17	102	−52.9	----	13	105	−60.1	----	21	105	−63.0	----
17,000	20	91	−62.7	----	20	90	−59.7	----	15	89	−63.0	----	12	87	−53.4	----	11	89	−59.5	----	21	89	−62.5	----
18,000	16	78	−61.6	----	15	76	−59.4	----	15	75	−62.1	----	10	76	−53.8	----	6	76	−58.8	----	19	75	−61.7	----
19,000	10	66	−60.4	----	11	65	−59.4	----	11	64	−60.8	----	----	----	----	----	5	64	−57.9	----	13	64	−61.3	----
20,000	5	56	−58.9	----	----	----	----	----	5	54	−60.1	----	----	----	----	----	----	----	----	----	10	54	−61.1	----
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Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																					
	Nashville, Tenn. (180 m.)				Nome, Alaska (14 m.)				Norfolk, Va.[1] (10 m.)[2]				Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	998	13.5	77	28	1,002	−1.5	81	23	1,022	12.5	86	31	1,016	14.4	83	30	972	16.2	65	31	981	13.4	69
500	31	961	17.0	65	28	943	−3.2	81	23	964	13.1	66	31	958	15.6	68	30	959	17.9	63	31	958	15.8	59
1,000	31	906	14.2	61	28	885	−6.0	81	23	908	11.1	64	31	903	13.9	61	30	905	16.1	57	31	903	14.8	51
1,500	31	854	11.0	61	28	830	−8.4	79	23	855	8.5	62	31	851	11.7	53	30	853	13.2	58	31	852	11.9	52
2,000	31	804	8.4	57	28	778	−10.6	73	23	804	6.2	57	31	801	9.0	48	30	803	10.3	56	31	802	9.3	51
2,500	31	756	6.5	52	28	729	−13.2	70	23	757	3.9	49	31	754	6.6	43	30	756	7.8	49	31	754	6.4	51
3,000	31	711	4.0	46	28	682	−15.8	67	23	711	1.5	43	31	709	3.9	40	30	711	4.8	48	31	709	3.5	49
4,000	31	628	−2.1	44	27	596	−21.5	61	22	628	−3.8	37	31	626	−2.1	39	28	628	−1.6	48	30	626	−3.0	49
5,000	29	553	−8.3	41	27	520	−27.8	58	19	552	−9.3	32	30	552	−8.3	39	28	554	−8.2	45	30	552	−9.3	47
6,000	28	486	−15.1	40	26	452	−34.7	55	----	----	----	----	30	484	−15.0	40	28	486	−15.2	45	29	484	−16.0	45
7,000	28	425	−22.3	39	26	391	−41.6	----	----	----	----	----	30	424	−22.1	40	28	425	−22.7	43	29	423	−22.9	43
8,000	28	370	−29.8	38	26	336	−47.9	----	----	----	----	----	30	369	−29.4	40	28	370	−29.8	41	29	368	−30.4	42
9,000	27	321	−37.8	38	26	289	−51.7	----	----	----	----	----	30	320	−36.5	39	28	321	−37.6	43	29	319	−38.3	41
10,000	26	277	−45.4	----	26	248	−52.3	----	----	----	----	----	28	276	−43.9	----	27	277	−45.0	----	25	275	−45.5	----
11,000	26	238	−51.5	----	26	212	−50.7	----	----	----	----	----	28	238	−50.5	----	27	238	−52.1	----	25	237	−52.3	----
12,000	26	204	−56.3	----	25	182	−49.3	----	----	----	----	----	27	203	−55.8	----	25	203	−57.7	----	24	202	−56.8	----
13,000	24	174	−59.9	----	25	156	−48.8	----	----	----	----	----	27	174	−58.7	----	25	173	−62.3	----	23	173	−60.0	----
14,000	21	148	−62.6	----	24	134	−49.0	----	----	----	----	----	26	148	−61.4	----	25	147	−66.7	----	19	147	−62.0	----
15,000	21	125	−65.8	----	22	115	−49.1	----	----	----	----	----	26	125	−64.2	----	25	125	−70.2	----	18	126	−63.8	----
16,000	19	106	−67.6	----	20	98	−49.0	----	----	----	----	----	23	106	−65.0	----	23	105	−71.7	----	18	107	−64.3	----
17,000	18	90	−66.5	----	18	85	−49.0	----	----	----	----	----	21	90	−63.5	----	22	89	−70.7	----	16	91	−64.0	----
18,000	17	76	−64.5	----	14	73	−49.0	----	----	----	----	----	19	76	−62.2	----	20	75	−67.7	----	13	77	−63.3	----
19,000	14	65	−62.7	----	12	62	−49.2	----	----	----	----	----	14	65	−61.4	----	15	63	−64.8	----	6	66	−61.9	----
20,000	10	55	−60.7	----	5	53	−49.7	----	----	----	----	----	8	55	−60.7	----	8	53	−62.0	----	----	----	----	----
21,000	6	47	−59.3	----	----	----	----	----	----	----	----	----	5	47	−59.7	----	----	----	----	----	----	----	----	----

See footnote at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees, Centrigrade, and relative humidities in percent, obtained by airplanes and radiosondes during October 1940*—Continued

Altitude (meters), m. s. l.	Stations with elevations in meters above sea level																					
	Pearl Harbor, T. H.[1 2] (6 m.)				Pensacola, Fla.[1 5] (24 m.)				Phoenix, Ariz. (339 m.)				San Diego, Calif.[1] (19 m.)				St. Thomas, V. I.[1 2] (8 m.)				Seattle, Wash.[1] (27 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	1,014	23.5	85	28	1,019	17.0	78	31	973	19.4	62	31	1,011	17.8	84	29	1014	27.2	83	29	1,012	13.2	85
500	31	958	22.3	78	28	963	18.2	63	31	956	22.7	52	31	956	18.1	56	29	958	21.0	97	29	957	11.9	73
1,000	31	905	19.2	79	28	908	14.7	62	31	902	21.1	43	31	902	18.0	35	29	904	17.8	90	29	902	9.0	70
1,500	31	854	17.1	71	28	856	11.5	61	31	851	17.5	42	31	851	16.1	26	29	853	15.0	85	29	849	6.0	71
2,000	31	804	15.0	62	28	806	9.6	50	31	802	13.6	44	31	802	13.3	26	29	804	12.5	84	28	798	2.9	71
2,500	31	758	13.5	46	28	758	7.4	42	31	756	9.9	46	31	755	10.1	27	29	757	10.2	76	27	750	−.1	65
3,000	31	715	11.6	38	28	713	3.9	41	31	711	6.3	47	31	710	7.1	29	29	713	7.7	68	27	704	−3.0	60
4,000	31	633	6.4	31	23	630	−2.7	40	30	629	−.2	48	31	628	1.5	28	28	631	1.5	62	26	619	−8.7	57
5,000	8	561	1.3	27	8	556	−8.6	43	29	555	−6.5	43	31	554	−5.1	22	----	----	----	----	24	543	−14.8	61
6,000	----	----	----	----	8	488	−14.8	43	29	487	−13.0	41	31	488	−12.1	35	----	----	----	----	22	476	−21.7	60
7,000	----	----	----	----	7	428	−22.1	46	28	427	−20.4	40	31	427	−18.4	28	----	----	----	----	20	415	−28.4	62
8,000	----	----	----	----	6	374	−28.8	----	28	372	−27.5	40	26	372	−26.0	----	----	----	----	----	16	360	−34.9	57
9,000	----	----	----	----	5	325	−35.5	----	26	323	−34.4	39	26	323	−33.4	----	----	----	----	----	12	312	−41.1	----
10,000	----	----	----	----	----	----	----	----	22	280	−41.3	----	26	280	−39.8	----	----	----	----	----	10	269	−46.1	----
11,000	----	----	----	----	----	----	----	----	19	241	−48.5	----	23	241	−45.7	----	----	----	----	----	8	232	−47.1	----
12,000	----	----	----	----	----	----	----	----	19	207	−54.5	----	20	207	−52.1	----	----	----	----	----	6	200	−47.1	----
13,000	----	----	----	----	----	----	----	----	18	177	−59.7	----	16	178	−56.9	----	----	----	----	----	6	172	−48.0	----
14,000	----	----	----	----	----	----	----	----	18	150	−64.6	----	15	152	−60.7	----	----	----	----	----	6	149	−48.5	----
15,000	----	----	----	----	----	----	----	----	18	127	−69.1	----	15	129	−63.6	----	----	----	----	----	6	129	−49.9	----
16,000	----	----	----	----	----	----	----	----	18	107	−71.9	----	15	110	−65.5	----	----	----	----	----	6	113	−52.6	----
17,000	----	----	----	----	----	----	----	----	16	90	−71.5	----	13	93	−67.0	----	----	----	----	----	6	98	−53.0	----
18,000	----	----	----	----	----	----	----	----	14	76	−69.4	----	10	79	−66.7	----	----	----	----	----	----	----	----	----
19,000	----	----	----	----	----	----	----	----	11	64	−67.0	----	7	67	−65.8	----	----	----	----	----	----	----	----	----
20,000	----	----	----	----	----	----	----	----	8	54	−65.0	----	----	----	----	----	----	----	----	----	----	----	----	----
21,000	----	----	----	----	----	----	----	----	6	46	−63.3	----	----	----	----	----	----	----	----	----	----	----	----	----

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																			
	S. S. Marie, Mich. (221 m.)				Swan Island, W. I. (10 m.)				Washington, D. C.[1] (7 m.)				Atlantic Station No. 1[3] (2 m.)				Atlantic Station No. 2[4] (2 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	992	5.6	85	30	1,011	26.1	82	30	1,019	9.5	83	21	1,014	18.9	76	27	1,016	20.7	79
500	31	959	5.0	87	30	956	23.6	84	30	959	9.7	68	21	956	14.8	81	26	960	16.1	85
1,000	31	901	3.0	87	30	904	20.3	85	30	904	8.0	63	21	901	11.1	83	26	904	13.3	84
1,500	31	847	.9	84	30	853	17.6	82	30	851	6.5	64	21	848	7.9	78	27	852	10.6	82
2,000	31	796	−1.0	78	30	804	15.2	83	30	800	4.9	57	21	798	5.5	75	26	802	8.4	75
2,500	31	747	−2.9	72	30	758	13.4	79	30	752	2.7	52	20	751	3.2	63	26	755	6.3	68
3,000	31	702	−5.2	69	30	714	11.1	73	30	706	.1	52	20	706	1.0	57	26	710	3.8	63
4,000	30	617	−10.5	65	28	633	6.0	66	30	623	−5.1	53	20	623	−4.1	53	26	627	−1.2	52
5,000	29	541	−16.3	63	28	560	−.1	61	30	548	−11.3	56	12	548	−9.4	43	24	552	−7.1	49
6,000	29	473	−22.9	61	28	494	−5.1	57	29	480	−18.0	54	11	480	−15.9	44	21	485	−13.8	49
7,000	29	412	−30.0	59	28	434	−10.9	53	29	419	−25.1	50	7	421	−21.9	44	20	425	−20.2	49
8,000	28	357	−37.6	57	28	380	−17.8	49	19	365	−32.3	----	6	366	−29.7	41	20	370	−27.2	50
9,000	28	308	−44.8	----	28	332	−25.0	47	17	316	−39.5	----	----	----	----	----	17	321	−35.0	49
10,000	27	265	−52.3	----	27	289	−32.9	46	14	273	−46.4	----	----	----	----	----	17	278	−42.5	----
11,000	25	227	−57.6	----	27	250	−41.2	----	8	236	−51.1	----	----	----	----	----	15	239	−50.6	----
12,000	25	194	−59.4	----	27	215	−49.2	----	6	202	−56.4	----	----	----	----	----	15	204	−58.4	----
13,000	23	165	−59.2	----	27	184	−57.2	----	6	173	−59.0	----	----	----	----	----	14	174	−63.2	----
14,000	21	140	−59.8	----	26	157	−65.0	----	5	148	−60.1	----	----	----	----	----	13	148	−66.7	----
15,000	21	119	−60.3	----	26	133	−72.3	----	----	----	----	----	----	----	----	----	11	124	−68.2	----
16,000	21	101	−60.4	----	25	112	−77.8	----	----	----	----	----	----	----	----	----	10	106	−67.9	----
17,000	19	86	−60.3	----	24	94	−79.0	----	----	----	----	----	----	----	----	----	8	89	−66.4	----
18,000	13	73	−60.0	----	21	79	−75.6	----	----	----	----	----	----	----	----	----	7	75	−64.9	----
19,000	8	62	−59.3	----	17	66	−71.8	----	----	----	----	----	----	----	----	----	7	64	−63.3	----
20,000	5	52	−59.3	----	16	56	−66.9	----	----	----	----	----	----	----	----	----	----	----	----	----
21,000	----	----	----	----	10	48	−62.5	----	----	----	----	----	----	----	----	----	----	----	----	----
22,000	----	----	----	----	7	40	−59.8	----	----	----	----	----	----	----	----	----	----	----	----	----

See footnotes at end of table.

LATE REPORTS

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees, Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during September 1940*—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level: Barrow, Alaska (6 m.)				Swan Island, West Indies (10 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	15	1,003	+0.3	93	30	1,010	27.0	86
500	15	942	−2.4	93	30	955	24.1	85
1,000	15	884	−4.2	88	30	902	21.3	82
1,500	15	830	−6.7	85	30	852	18.6	79
2,000	15	778	−9.1	81	30	803	16.1	77
2,500	15	729	−11.0	77	30	757	13.9	73
3,000	15	683	−13.7	79	30	713	11.5	69
4,000	14	598	−19.5	78	30	633	6.1	66
5,000	14	522	−25.2	73	29	560	.1	69
6,000	14	454	−32.0	71	29	493	−5.4	67
7,000	13	393	−39.3		29	434	−11.1	66
8,000	13	339	−46.5		29	380	−17.3	64
9,000	13	291	−51.5		29	331	−24.3	62

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level—Continued: Barrow, Alaska (6 m.)				Swan Island, West Indies (10 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
10,000	13	249	−53.0		29	288	−32.0	60
11,000	13	214	−49.2		27	250	−40.3	
12,000	12	184	−47.5		27	215	−48.5	
13,000	11	158	−47.0		25	185	−56.4	
14,000	10	135	−46.9		25	157	−63.9	
15,000	7	116	−46.8		24	133	−71.0	
16,000	7	100	−47.0		24	112	−75.9	
17,000	5	86	−47.8		24	94	−77.1	
18,000					20	79	−74.6	
19,000					18	67	−70.4	
20,000					12	57	−66.4	
21,000					8	48	−63.0	
22,000					5	41	−60.7	

[1] U. S. Navy.
[2] Airplane observations.
[3] In or near the 5° square: Lat. 35°00′ N. to 40°00′ N.; Long. 55°00′ W. to 60°00′ W.
[4] In or near the 5° square: Lat. 40°00′ N. to 45°00′ N.; Long. 40°00′ W. to 45°00′ W.
[5] Radiosonde and airplane observations.

NOTE.—All observations taken at 12:30 a. m., 75th meridian time, except at Washington, D. C., and Lakehurst, N. J., where they are taken near 5 a. m., E. S. T., at Norfolk, Va., where they are taken at about 6 a. m., and at Pearl Harbor, T. H., after sunrise.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels; also, the humidity data are not used in daily observations when the temperature is below −40° C.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during October 1940. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters), m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N.Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (18 m.)			Chicago, Ill. (192 m.)			Cincinnati, Ohio (157 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	178	2.5	31	189	1.7	31	300	1.2	31	295	2.7	31	265	1.5	30	313	1.3	31	117	4.4	30	291	2.0	31	270	0.4	30	87	0.7	30	245	1.1	31	312	0.9	31	84	1.1
500							31	304	1.4										31	122	4.4	30	261	3.1	31	294	2.4	30	42	1.2	30	237	1.7	31	260	1.7			
1,000	31	179	3.3				31	292	1.4				31	266	2.2	30	300	.8	30	139	3.1	29	260	5.9	30	280	4.5	28	328	1.3	30	241	3.8	31	256	2.7			
1,500	31	173	3.8				31	277	1.5	31	279	4.3	28	251	3.4	30	203	.7	28	137	2.2	28	274	6.2	27	290	5.9	26	318	2.5	28	261	5.2	30	273	3.7			
2,000	30	197	4.1	31	201	2.6	30	297	2.6	31	266	5.6	25	283	5.6	30	239	2.5	24	143	2.2	25	290	8.0	23	293	6.3	25	318	4.2	24	277	6.5	29	281	6.1	31	96	1.2
2,500	28	209	3.8	31	212	2.8	29	305	4.0	29	270	7.4	23	299	9.5	29	237	4.9	20	146	1.6	19	305	9.2	16	280	6.3	25	314	4.2	23	284	7.9	27	287	7.4	31	122	.9
3,000	26	236	4.0	31	220	2.9	28	310	5.1	28	266	8.2	21	297	11.7	28	242	6.3	17	175	.9	17	310	11.0	12	290	6.1	24	306	5.3	20	281	9.6	26	291	9.3	31	260	2.0
4,000	23	247	4.9	30	256	4.6	27	313	6.9	26	272	11.4	19	300	16.3	25	243	8.6	15	286	1.2	15	306	14.7				21	300	6.1	18	291	10.3	19	297	9.8	27	263	6.2
5,000	23	261	5.7	27	251	5.1	27	310	9.1	21	273	13.6	17	302	16.7	19	258	10.7	12	266	4.2							20	294	8.5	14	286	10.8	16	300	10.0	27	271	8.3
6,000	21	277	6.6	25	275	4.7	27	309	10.3	20	276	15.8	13	306	18.7	15	271	9.8	10	280	6.4							19	289	8.4	14	295	13.0	12	309	9.6	25	275	10.2
8,000	15	278	9.0	21	295	5.3	24	302	14.3	16	276	15.7	12	305	22.9	13	278	9.7										12	302	11.6							23	275	9.7
10,000	13	283	9.3	16	295	9.1	23	302	18.6	10	290	18.6				11	283	12.0																			21	278	12.7
12,000	10	279	14.4	13	272	15.1	22	299	23.2																												18	277	14.9
14,000				11	277	13.4	21	297	24.1																												13	256	18.4
16,000				10	268	11.4	18	291	17.5																														
18,000							10	276	16.5																														

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (766 m.)			Jacksonville, Fla. (14 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (79 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (10 m.)			Minneapolis, Minn. (261 m.)			Mobile, Ala. (10 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	31	304	0.5	31	208	1.5	31	311	0.8	28	293	0.4	29	255	2.8	31	64	3.5	31	133	1.4	31	150	1.3	29	327	0.2	30	51	3.2	30	240	0.5	31	192	0.5	31	291	0.7
500										28	238	.7				31	63	3.0				31	187	1.9	29	335	.2	30	51	5.0	30	228	1.5	31	299	1.0	31	270	1.4
1,000										28	254	2.7	29	258	5.3	30	29	1.0	31	149	2.2	31	205	2.3	29	232	.7	30	37	4.3	30	235	3.9	29	354	1.6	30	278	1.6
1,500	31	246	.4				31	300	1.0	28	280	4.8	29	265	7.4	30	322	1.4	31	177	2.2	31	249	2.9	29	216	3.1	29	28	3.7	30	247	5.5	29	12	2.7	29	292	2.6
2,000	31	195	1.3	31	209	1.9	31	278	.9	28	295	5.6	28	265	8.2	30	328	1.8	31	203	3.0	31	278	3.8	28	216	5.5	27	7	2.9	28	279	7.9	29	356	2.6	29	294	3.4
2,500	31	186	1.8	31	219	2.4	31	251	2.2	27	309	7.0	27	266	9.7	30	327	2.8	31	225	3.2	31	275	4.0	23	215	5.9	29	332	2.9	26	284	11.2	29	352	2.8	29	301	4.9
3,000	29	213	3.2	31	226	3.0	31	222	4.0	25	314	7.8	23	264	9.8	30	315	3.6	31	240	3.6	31	280	4.0	21	219	6.9	28	307	3.2	25	287	12.4	29	335	2.0	27	306	5.8
4,000	27	228	5.2	28	227	4.1	28	244	4.1	24	306	8.8	18	275	12.7	29	310	5.1	30	241	4.7	28	285	6.1	18	230	9.5	28	291	4.5	18	296	15.6	29	320	3.4	22	305	6.6
5,000	26	243	5.6	24	255	5.2	23	258	4.5	24	309	10.2	11	266	13.0	28	305	7.8	28	265	5.4	27	296	7.1	18	230	10.0	26	283	7.0	11	294	11.9	26	301	5.9	20	304	7.4
6,000	23	247	6.8	21	269	6.1	21	280	5.3	24	297	11.9				26	300	9.6	26	270	7.6	24	308	7.9	17	229	13.8	26	276	8.8				23	300	7.9	19	297	8.4
8,000	16	258	9.5	20	283	10.5	15	296	3.9	21	297	13.3				25	294	12.8	22	287	11.0	20	291	9.8				20	271	14.6				15	299	11.4	16	307	11.1
10,000				18	283	12.5				19	300	15.5				25	292	15.7	21	291	12.9	14	299	15.8				16	273	19.8				12	290	18.9	12	305	14.9
12,000				18	271	17.5				18	294	19.8				23	291	21.6	19	278	16.1							13	272	19.5									
14,000				16	268	14.3				13	272	21.9				19	288	21.6	16	283	14.7							12	282	19.2									
16,000				12	270	13.7										17	278	17.5	13	282	8.7							12	284	13.3									

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during October 1940. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*—Continued

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (344 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (183 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (230 m.)			Seattle, Wash. (14 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (10 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	28	318	1.6	31	273	3.8	31	184	2.9	31	186	1.9	31	198	0.5	31	339	2.6	31	214	1.6	31	140	2.2	29	292	4.4	26	293	1.9	27	267	9.7	29	190	1.3	30	305	0.8
500	28	296	3.6	31	278	3.4	31	180	3.6	31	189	2.8	31	210	1.0	---	---	---	31	227	2.6	31	140	3.2	29	298	3.3	26	268	2.9	27	200	2.4	---	---	---	30	318	2.0
1,000	27	300	5.4	31	273	2.8	31	193	3.8	31	208	3.5	31	199	1.1	31	339	2.6	30	233	3.9	30	150	2.4	28	275	2.7	24	276	4.0	25	199	4.5	29	197	2.9	29	313	4.1
1,500	26	305	6.1	31	246	2.4	31	208	4.2	30	230	5.2	31	126	1.2	31	323	3.2	30	258	4.8	29	144	2.4	27	287	.3	22	267	5.1	24	201	6.1	29	214	4.6	25	297	7.4
2,000	24	313	7.5	30	240	2.8	31	225	5.2	28	256	6.2	29	139	1.5	30	297	3.7	29	276	5.0	27	146	1.9	27	69	.8	16	290	7.2	17	204	4.6	27	228	6.6	23	302	9.0
2,500	22	306	10.0	30	246	3.7	31	240	5.3	27	264	8.1	29	151	1.7	30	278	5.8	29	286	6.0	26	152	1.4	27	51	1.1	11	308	8.9	16	205	6.5	21	241	7.8	19	296	9.8
3,000	21	295	9.1	30	246	3.9	28	257	6.2	27	269	9.2	29	173	1.6	30	278	7.8	28	294	7.5	25	242	.5	24	21	1.6	11	309	11.0	12	210	7.9	16	241	11.5	19	298	9.8
4,000	10	310	8.1	28	270	4.7	26	266	7.1	27	283	11.1	29	167	1.8	27	286	10.0	27	299	9.5	21	284	2.2	22	308	3.1	---	---	---	10	227	10.0	14	247	13.0	16	290	10.8
5,000	---	---	---	28	261	7.2	22	282	8.3	24	291	12.8	27	253	2.0	27	286	12.7	25	304	10.7	21	282	3.3	19	289	5.9	---	---	---	---	---	---	---	---	---	13	283	10.2
6,000	---	---	---	24	275	8.0	21	289	9.4	23	292	14.4	27	268	3.1	25	286	13.9	23	306	10.4	19	292	6.7	15	285	6.3	---	---	---	---	---	---	---	---	---	11	283	10.0
8,000	---	---	---	21	279	11.3	19	301	10.8	19	290	15.8	24	305	5.7	19	295	15.9	23	304	13.0	15	267	12.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10,000	---	---	---	18	279	13.2	14	299	15.1	17	299	18.9	21	299	8.1	14	290	16.4	18	307	14.8	13	266	19.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12,000	---	---	---	13	284	16.9	13	299	17.2	10	300	18.9	12	287	10.7	13	291	20.0	14	295	21.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14,000	---	---	---	---	---	---	---	---	---	10	294	19.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16,000	---	---	---	---	---	---	---	---	---	10	293	14.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 3.—*Maximum free-air wind velocities, (m. p. s.), for different sections of the United States, based on pilot-balloon observations during October 1940*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	44.1	WSW	1,660	5	Syracuse, N. Y.	45.7	NW	5,000	26	Albany, N. Y.	49.6	NNW	14,760	10	Albany, N. Y.
East-Central [2]	28.4	WSW	2,161	19	Greensboro, N. C.	37.6	NW	4,530	17	Knoxville, Tenn.	57.0	N	11,571	4	Greensboro, N. C.
Southeast [3]	28.4	W	1,910	19	Birmingham, Ala.	30.0	WNW	3,320	19	Atlanta, Ga.	67.0	WNW	19,090	30	Miami, Fla.
North-Central [4]	46.8	S	1,594	17	Rapid City, S. Dak.	46.5	WSW	3,710	6	Muskegon, Mich.	51.2	NW	7,120	21	Alpena, Mich.
Central [5]	35.8	N	1,770	14	Dodge City, Kans.	45.6	N	4,660	17	Fort Wayne, Ind.	55.2	SW	10,420	31	Wichita, Kans.
South-Central [6]	29.0	S	820	3	Oklahoma City, Okla.	34.6	SW	4,620	28	Tulsa, Okla.	60.3	WNW	12,800	23	Houston, Tex.
Northwest [7]	38.0	W	2,120	18	Havre, Mont.	36.0	W	4,100	17	Great Falls, Mont.	53.3	WNW	12,980	16	Billings, Mont.
West-Central [8]	34.3	WNW	2,290	4	Cheyenne, Wyo.	42.0	SSW	3,200	25	Modena, Utah	66.0	SW	7,630	27	Pueblo, Colo.
												WSW	13,960	4	Denver, Colo.
Southwest [9]	28.9	SSW	1,720	5	Roswell, N. Mex.	42.3	SW	4,960	27	Albuquerque, N. Mex.	72.7	WSW	12,460	2	Las Vegas, Nev.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except extreme west Texas), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during October 1940, classified according to the potential temperatures (10° intervals between 290° and 409° A.) with which they are identified (based on radiosonde observations)*

Potential temperatures, °A.	Anchorage, Alaska			Barrow, Alaska			Bismarck, N. Dak.			Brownsville, Texas			Charleston, S. C.			Denver, Colo.			El Paso, Texas			Ely, Nev.		
	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299	7	6.5	−41.6	9	6.8	−45.0																		
300–309	21	7.9	−49.2	22	7.9	−49.1																3	6.8	−35.0
310–319	21	8.8	−52.3	16	9.2	−54.9	11	9.7	−51.5							3	8.2	−41.0				6	7.9	−36.8
320–329	13	9.9	−55.6	5	10.2	−58.0	22	10.4	−53.4				24	9.0	−38.0	17	9.7	−45.0	10	9.2	−39.0	21	9.6	−44.4
330–339	1	10.2	−52.0	1	11.0	−60.0	20	11.5	−58.4	5	10.0	−38.4	29	10.8	−49.8	21	11.1	−52.6	14	10.8	−48.0	16	11.2	−54.6
340–349							5	13.1	−66.4	12	12.4	−56.5	15	12.3	−58.1	11	12.6	−61.8	13	12.0	−52.9	12	12.5	−60.1
350–359	2	11.6	−52.0				1	12.6	−57.0	9	14.4	−70.6	4	13.2	−61.2	4	13.3	−61.5	7	13.4	−61.6	7	12.9	−59.6
360–369							2	13.9	−63.5	14	15.1	−71.1	3	14.0	−62.7	8	14.5	−66.0	14	14.8	−68.7	5	14.0	−62.0
370–379	2	13.5	−56.0							6	15.7	−71.3	11	15.1	−66.7	4	15.1	−67.2	9	15.7	−71.8	7	14.9	−64.1
380–389	2	13.6	−52.5				5	14.9	−61.2	8	16.6	−74.2	9	15.7	−68.3	3	15.5	−65.3	11	16.3	−72.5	9	15.4	−64.7
390–399	1	14.2	−51.0				4	15.2	−61.2				8	16.2	−68.2	3	16.0	−65.3	4	16.9	−72.5	5	15.7	−63.6
400–409	2	14.6	−53.0	1	14.1	−50.0	3	16.5	−64.7	2	18.0	−75.5	6	16.8	−67.3	3	16.7	−67.0				2	16.2	−63.5
Weighted means		9.1	−51.1		8.5	−51.2		11.7	−57.1		14.3	−65.6		12.3	−54.7		12.2	−56.0		13.3	−59.5		12.0	−54.4
Mean potential temperature °A. (weighted)	319.6			309.9			340.5			362.0			351.8			346.7			356.3			347.2		
Number days with observations	25			21			25			20			30			23			26			26		

Potential temperatures, °A.	Great Falls, Mont.			Joliet, Ill.			Ketchikan, Alaska			Lakehurst, N. J.			Medford, Oreg.			Nashville, Tenn.			Nome, Alaska		
	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299							3	7.0	−44.7										6	6.6	−42.2
300–309	3	7.5	−40.7				8	7.0	−40.2	1	7.7	−42.0	4	7.2	−38.2				26	7.5	−45.3
310–319	6	9.6	−53.7	6	8.5	−41.7	19	8.7	−47.9	2	9.1	−48.0	6	8.2	−41.5	2	7.4	−30.5	20	8.8	−51.4
320–329	25	10.2	−52.1	18	10.1	−51.9	16	10.1	−52.8	17	9.7	−48.6	17	9.4	−44.8	16	9.8	−45.2	8	9.8	−54.8
330–339	16	11.8	−59.9	21	10.4	−52.4	9	11.4	−58.2	15	11.3	−56.6	19	11.2	−55.3	20	11.2	−53.6	1	10.7	−57.0
340–349	3	12.8	−64.0	7	12.3	−60.1	3	12.0	−56.3	2	12.3	−61.5	8	12.1	−57.8	9	12.3	−58.8			
350–359	3	13.4	−61.0	2	13.0	−59.0	1	12.2	−52.0	1	13.1	−61.0	5	13.3	−60.4	5	13.4	−64.8			
360–369	1	13.8	−62.0	1	13.5	−61.0	1	13.8	−61.0	2	13.4	−60.0	5	13.9	−62.4	4	14.9	−70.5	1	11.6	−48.0
370–379	3	14.0	−59.3	4	14.7	−65.0				2	14.6	−64.0	5	14.7	−63.4	3	15.6	−70.0			
380–389	5	14.9	−63.0	6	15.0	−62.3				2	15.4	−64.5	5	15.2	−63.8	5	15.7	−71.2	1	14.1	−53.0
390–399	5	15.4	−61.8	3	15.5	−64.7				2	15.8	−63.5	2	15.8	−63.5	6	15.9	−64.5			
400–409	1	16.6	−65.0	4	16.2	−63.0				1	14.8	−55.0	3	16.4	−67.0	3	16.6	−64.7	1	14.8	−52.0
Weighted means		11.6	−56.5		11.6	−55.1		9.5	−50.3		11.3	−54.4		11.6	−53.8		12.4	−56.7		8.4	−48.5
Mean potential temperature °A. (weighted)	340.8			345.4			321.1			339.1			343.4			349.0			313.1		
Number days with observations	29			22			25			21			25			24			26		

Potential temperatures, °A	Oakland, Calif.			Oklahoma City, Okla.			Omaha, Nebr.			Phoenix, Ariz.			San Diego, Calif.			Sault Ste Marie, Mich.			Swan Island, West Indies		
	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299																					
300–309							2	6.8	−33.0							4	6.7	−36.2			
310–319	5	8.0	−36.6	1	8.4	−38.0	2	8.2	−42.5	3	7.4	−30.7	1	9.1	−47.0	8	8.9	−47.8	1	10.8	−40.0
320–329	11	9.4	−42.9	14	9.5	−43.6	14	9.7	−46.4	8	8.8	−34.4	3	9.2	−38.7	23	10.4	−55.8			
330–339	27	11.2	−54.1	25	11.2	−54.6	18	11.4	−56.3	11	10.9	−49.5	11	10.1	−41.4	12	11.5	−60.1	1	9.2	−28.0
340–349	10	12.4	−59.9	6	13.0	−64.2	13	12.3	−58.7	9	11.5	−48.3	5	12.3	−57.2	4	12.1	−58.2	20	11.4	−45.2
350–359	4	13.5	−65.5	6	14.0	−67.5	5	13.2	−61.0	10	13.4	−60.9	5	12.8	−56.2	1	13.8	−65.0	20	14.1	−66.2
360–369	5	14.8	−69.8	8	15.0	−71.2	1	14.1	−65.0	2	13.8	−60.0	3	14.1	−64.0	2	13.5	−63.0	18	15.9	−78.2
370–379	7	15.3	−70.1	12	15.4	−72.4	5	14.9	−65.8	15	15.4	−68.5	5	14.7	−63.0	4	14.0	−60.5	10	16.6	−79.5
380–389	7	15.5	−65.1	6	16.5	−75.7	3	14.8	−61.0	5	15.9	−70.4							4	16.9	−76.5
390–399	5	16.0	−65.4	2	16.2	−68.5	3	15.7	−65.0	3	16.5	−70.0	2	15.8	−65.5	5	15.4	−62.8			
400–409	3	16.2	−63.7	1	17.2	−73.0	4	16.4	−65.0	3	17.3	−71.0	3	17.2	−71.7	3	15.8	−61.3	1	17.9	−78.0
Weighted means		12.4	−57.0		12.8	−60.6		12.0	−55.9		12.9	−56.2		12.4	−53.6		11.3	−56.0		14.2	−65.1
Mean potential temperature °A. (weighted)	349.4			349.5			345.9			355.9			353.8			338.2			358.5		
Number days with observations	27			25			24			19			17			25			25		

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during October 1940, classified according to the potential temperatures (10° intervals between 290° and 409° A.) with which they are identified (based on radiosonde observations)*—Continued

Potential temperatures °A.	Atlantic Sta. No. 2[1]			Potential temperatures °A.	Atlantic Sta. No. 2[1]		
	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.		Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299				370–379	1	15.2	−70.0
300–309	1	7.7	−41.0	380–389	2	15.6	−67.0
310–319				390–399	3	16.2	−68.3
320–329	3	9.0	−40.7	400–409			
330–339	16	11.6	−56.9	Weighted means		12.7	−60.4
340–349	7	13.0	−64.3				
350–359	2	14.1	−67.5	Mean potential temperature °A. (weighted)		347.9	
360–369	7	14.2	−67.1	Number days with observation		15	

[1] In or near the 5° square: Lat. 40° 00′ N. to 45° 00′ N., long. 40° 00′ W. to 45° 00′ W.

WEATHER ON THE NORTH ATLANTIC OCEAN

By H. C. HUNTER

Atmospheric pressure.—The pressure over the North Atlantic during October 1940, averaged less than normal for the central and much of the southwestern portions and particularly for the northwestern, adjacent to northern Newfoundland and southern Labrador. Near the eastern coast of the United States from Cape Cod southward the pressure somewhat exceeded the normal, likewise over the northern Gulf of Mexico.

In the available reports from vessels the extremes of pressure were 1,031.5 and 982.7 millibars (30.46 and 29.02 inches). The high mark was recorded during the early afternoon of the 5th, near the coast of southern New Jersey, on the American liner *Dixie*. The low reading was noted on the morning of the 22d in the southwestern Caribbean area, under the influence of the earlier of the two tropical disturbances, on the Honduran S. S. *Castilla*.

Over waters remote from the Tropics the lowest mark reported from a vessel was 988.2 millibars (29.18 inches) on the Coast Guard cutter *Spencer*, near 41° N., 61° W., on the 20th. Table 1 shows that a reading lower by about 6 millibars was noted the preceding day at the land station at Belle Isle, Newfoundland.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, October 1940*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Herta, Azores	1,018.5	−1.1	1,026	9	1,008	14
Belle Isle, Newfoundland [1]	1,007.6	−3.6	1,019	4	982	19
Halifax, Nova Scotia	1,016.3	−1.0	1,028	5, 6	998	18
Nantucket	1,017.6	0.0	1,031	5	1,006	18
Hatteras	1,018.3	+0.3	1,029	22	1,006	20
Turks Island	1,012.8	−1.4	1,016	29, 30	1,008	24
Key West	1,015.6	+1.7	1,020	22	1,010	8
New Orleans	1,018.6	+1.7	1,026	18	1,008	31

[1] For 26 days.

NOTE.—All data based on available observations, departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—There was apparently less storm activity than during an average October, and the final fortnight included nearly all that has been reported.

In the region of Newfoundland and Labrador pressure was decidedly low from the 18th to 22d, and on the 20th a vigorous LOW of small area, advancing northeastward from near the Virginia Capes, formed a southward extension of the large area. The Coast Guard cutter *Pontchartrain*, near 39½° N., 58° W., was in the path of this small LOW, and recorded a gust of force 12 about 9 p. m.

There was one other instance of force 12, which probably was likewise a brief gust. This was near the middle of the night of the 26th–27th, about 700 miles to eastward of the *Pontchartrain's* position just mentioned. The vessel was the Coast Guard cutter *Sebago*. A large LOW system, including some secondary centers, was indicated as extending from north-northeast to south-southwest over the *Sebago's* position.

Tropical disturbances.—On page 280 in this REVIEW is an account of two disturbances originating within the Tropics, neither of which seems to have caused winds of greater force than a whole gale. The earlier, occurring during the 20th to 23d, was confined to the southwestern Caribbean Sea till it crossed the coast line into Central America where it dissipated. The later LOW, noted from the 24th to 26th, was felt first not far from the Windward Passage, and moved thence for a time nearly northward and afterward more rapidly northeastward till it was a considerable distance to northeastward of Bermuda, where its identity was lost, owing to lack of vessel reports.

Fog.—Very little fog has been reported, even less than during September just preceding. This is the usual trend of fog occurrence during the fall season.

In the 5° square, 35° to 40° N., 75° to 80° W., fog was noted on 4 days, or more than in any like area elsewhere in the North Atlantic. This square includes waters close to the coast from southern New Jersey to slightly south of Hatteras, also Chesapeake Bay and most of Delaware Bay. The square next to eastward had fog on 3 days; and almost all of the fog of these two squares came during the second half of the month, there being somewhat more than the average found for these sections from records of previous Octobers.

Over waters near New England and Nova Scotia fog was noted much less often than usual in October, though the square 40° to 45° N., 65° to 70° W., furnished reports for 3 days.

No fog was reported over any North Atlantic area to southward of the 35th parallel of latitude, while to eastward of the 55th meridian only one mention has come to notice, that stating that there was fog on the 5th in the vicinity of the western Azores.